

2007 Retired Engineer and Technical Assistance Program (RETAP) Student Project Summary



BIOLAB, INC.

David Carpenter, Senior, Chemical Engineering Student
University of Michigan

Project Title: Optimize the Wastewater Treatment Process to Reduce the Use of Sodium Sulfite

Mr. David Carpenter was assigned to BioLab, Inc., a chemical manufacturing plant in Adrian, Michigan, that makes biocides that prevent the growth of a wide range of bacteria, algae, and fungi in water systems (i.e.: commercial pools, spas, and industrial cooling water and wastewater systems).

Mr. Carpenter was successful at researching and implementing the installation of an inline jet mixer system for two wastewater treatment tanks. Lower capital and operation cost were the basis for the selection of the mixers. The installation resulted in a more uniform mixture of sodium sulfite in the effluent solution. Tentative results shows progress, but additional data must be collected to determine the effectiveness of the mixers at reducing the amount of sodium sulfite needed to treat the effluent. The company is committed to continuing studies to optimize the quantity used in the treatment process. Mr. Carpenter recommended retarding the introduction rate of the sodium sulfite into the effluent stream to improve the kinetic reaction in the mixture. Another area was to reconfigure the sample loop to eliminate the bypass of the tank. This will provide a true sample of the mixture for measuring/monitoring the pH. Success will decrease the disposal rate of excess sodium sulfite to an injection well.

Mr. Carpenter also implemented the use of a pneumatic air hose with a rotary air nozzle to clean the flash dry tube. The old method contracted a vendor to use a water blast system to clean the tube. The change saved 40,000 pounds of product from disposal, resulting in \$53,000 of savings due to the elimination of contractor services. The disposal cost associated with waste generation from the cleaning process, and increased revenue from sells of reclaimed product. The system required maintenance staff to rig a pulley system to support the weight of the hose system that reclaims more than 95 percent of the product from clogged material handling lines.





SCENIC VIEW FARM

Theo VanAken, Senior, Biosystems Engineering Student; and
Andrew Austin, Senior, Biosystems Engineering Student
Michigan State University
Project Title: Start Up of an Anaerobic Digester

Mr. Theo VanAken and Mr. Andrew Austin were assigned to Scenic View Farms to start up a third manure anaerobic digester to increase methane gas production for sale and to power natural gas powered electric generators on-site. Scenic View Farms is a 2,200 milking head dairy operation with an additional 1,400 heifers located in Fennville, Michigan.

The start up of the third digester increased capacity volume from 1.74 million gallons to 2.6 million gallons, and increase methane gas production from 200 cubic feet per minute (cfm) to 300 cfm. The digesters treat 60,000 gallons per day of manure with a solids content of 9 percent, and 15,000 gallons of syrup stillage waste from an ethanol production process with a solids content of 38 percent. The system produces biogas with a composition of 58-62 percent methane gas that is refined using a pressure swing adsorption system that upgrades the biogas to pipeline quality natural gas. Some of the refined biogas is used to power two on-site, 350 kilowatt Caterpillar generators, and the remainder of the biogas is sold to Michigan Gas Company. Farming operations are powered by the electricity generated onsite, and extra electrical capacity that is sold to Consumers Energy.

The system improvements from the expansion are: a greater capture of carbon emissions, increased energy production, and increased manure treatment capability. Anaerobic digestion produces usable methane, decreases manure volume, increases usable nutrients in manure for crop generation, and decreases manure odor.



AGRI-SERVE LLC. AND MICHIGAN STATE UNIVERSITY EXTENSION

Thomas Shedd, Junior, Biosystems Engineering Student
Michigan State University
Project Title: Analysis of a Truck Mounted Variable Rate Application System

Mr. Thomas Shedd was assigned to Agri-Serve, LLC., located in Holland, Michigan in conjunction with Michigan State University, Ottawa Extension Office. Mr. Shedd was successful at researching and developing a cost analysis of a VRA truck mounted system that will reduce the chance of edge-of-the-field nutrient loss.

The VRA system consists of a programmable flow meter that uses a Hewlett Packard, iPAQ with Farmworks Site Mate software (Site Mate) program. The software allows the driver to regulate the application of manure by adjusting the flow rate in gallons per minute. The system is connected to a signal converter which allows the Site Mate program to monitor all of the outputs, including signals from the Global Positioning System (GPS) that allows the driver to track the applied areas

and simulate the distance to between pass; and therefore, reduce overlap and increase the accuracy of application leading to a more consistent spread and have less gaps. Over lap from 3 to 5 feet will be reduced to 6 to 30 inches, with the use of the GPS unit.



MICHIGAN DEPARTMENT OF TRANSPORTATION

Alex Lopez, Junior, Civil Engineering Student
University of Michigan
Project Title: Power Factor Correction and Energy Efficiency

Mr. Alex Lopez was assigned to Michigan Department of Transportation in Lansing, Michigan, a government agency.

Mr. Lopez was successful at developing a spill prevention control countermeasure (SPCC) checklist that helped small airports develop customized SPCC plans for their sites throughout Michigan. Wexford County Airport in Cadillac, Michigan, was used to model the base SPCC checklist for small airports. The process involved a site review of each airport to determine what the airport would need to devise a plan. The plan has several sections that outline the location of fuel tanks, hazardous materials, vulnerable water bodies, maintenance log records, operation site descriptions, and a number of other site specific conditions.



RAPID-LINE, INC.

Jacob Kallie, Senior, Mechanical Engineering Student
Lawrence Technological University
Project Title: Waste Reduction and Energy Efficiency Retrofits

Mr. Jacob Kallie was assigned to Rapid-Line, Inc. located in Grand Rapids, Michigan, is a metal fabrication facility that operates state-of-the-art production equipment and other processes including: cad cam design, laser cutting, metal stamping, tube bending and cutting, CNC milling, and other metal finishing processes.

Mr. Kallie was successful at implementing a number of pollution prevention projects that reduced electrical usage and promoted waste reduction practices plantwide. A sizable reduction in waste disposal was achieved through strong recycling efforts, along with reduced electrical consumption by optimizing operating parameters for the infrared ovens and the compressed air system, adjusting office and production area heating and cooling practices, and the introduction of lighting retrofits. The combination of these practices produced a total savings of approximately \$58,504 a year.

